The heat pump module includes a compression device that compresses the heated cooling fluid from the stack to raise its temperature and pressure, a cooling device for cooling the compressed and heated cooling fluid from the compression device and an expansion device for decreasing the pressure and temperature of the compressed and cooled cooling fluid from the cooling device.

Applicant submits that each and every claim element must be shown in a prior art reference for a claim to be anticipated. For the reasons given below, Applicant respectfully submits that U.S. Patent No. 6,370,903 and 5,678,410 cannot anticipate independent claims 1, 7 and 13 for this reason.

U.S. Patent No. 6,370,903 issued to Wlech discloses an air conditioner for a fuel cell vehicle. Figure 1 shows a heat pump 10 including an external coolant circuit 12 for a fuel cell 18 and a refrigeration circuit 14 that provides air conditioning for the passenger compartment of the vehicle. The coolant circuit 12 includes a fuel cell 18, a pump 20, an evaporator 22, a passageway 24 and a radiator 26. The pump 20 pumps a cooling fluid through the passageway 24 and through the fuel cell 18 to absorb heat therefrom, which is then cooled by the radiator 26. The evaporator 22 provides a heat exchange relationship between the refrigerant of the refrigeration circuit 14 and the cooling fluid of the external coolant circuit 12. Figures 2 and 4 show variations of this design.

Applicant submits that the fuel cell stack cooling system fairly taught and suggested by Wlech is the type of system Applicant's invention is improving upon. Applicant's claimed system reduces the temperature of the cooling fluid that cools the fuel cell stack. The heat pump module of the Wlech system is for an air conditioning unit that cools the passenger compartment of a vehicle. Wlech does not teach or suggest a heat pump module including a compression device, a cooling device and expansion device that are used to reduce the temperature of the cooling fluid that flows through the fuel cell

stack. In order to provide this, Wlech would have to use these elements in the coolant circuit 12 to cool the cooling fluid propagating therethrough.

Each of independent claims 1, 7 and 13 specifically states that it is the cooling fluid from the fuel cell stack that is first compressed by the compression device, then cooled by the cooling device and then expanded by the expansion device to provide increased cooling. The compressor 28, the expansion valves 50 and other heat-pump components in the refrigeration circuit 14 do not receive the cooling fluid from the fuel cell 18. The heat pump 10 taught by Wlech uses evaporative cooling to cool the passenger compartment of the vehicle, and not to reduce the temperature of the cooling fluid that cools the fuel cell stack. Therefore, Applicant respectfully submits that Wlech cannot anticipate Applicant's independent claims 1, 7 or 13. Also, for these reasons, Wlech cannot make obvious Applicant's claimed invention.

U.S. Patent No. 5,678,410 issued to Fujita et al. discloses a fuel cell system for a vehicle that includes metal hydride storage tanks 11-18 for supplying hydrogen to a fuel cell 2 and a heat exchanger 2A for cooling the fuel cell 2 (column 7, lines 10 and 11). The Fujita et al. fuel cell system includes an air conditioning apparatus 420 for cooling the passenger compartment of the vehicle. The air conditioning apparatus 420 uses the cooling power generated by the discharge of hydrogen from the metal hydride storage tanks 11-18 to provide the cooling. Column 2, line 59 – column 23, line 10 of Fujita et al. talks about a compressor 423 and an expansion valve 424. However, these devices are used in the air conditioning apparatus 420 to provide vapor compression refrigeration. Neither of the compressor 423 or the expansion valve 424 receives a heated cooling fluid from a fuel cell stack as claimed by Applicant.

Fujita et al. appears to disclose a cooling system for the fuel cell 2 that uses the cooling power from the evaporation of hydrogen in the metal hydride storage tanks 11-18,

where the cooling fluid flows through conduits 91 and 93 and is controlled by various valves (9, 15). Also, the cooling fluid is directed through a radiator 92 to remove the heat therefrom. However, Fujita et al. does not appear to use the combination of a compression device, a cooling device and an expansion device for cooling the cooling fluid that cools a fuel cell stack as set forth in Applicant's independent claims 1, 7 and 13.

Applicant submits that nowhere in Fujita et al. does it teach or suggest using a compression device to raise the temperature and pressure of a heated cooling fluid from a fuel cell stack, a cooling device for reducing the temperature of the compressed and heated cooling fluid and an expansion device for decreasing the pressure and temperature of the compressed cooling fluid before it is sent to the fuel cell stack. Therefore, Applicant respectfully submits that Fujita et al. also cannot anticipate Applicant's claimed invention.

In view of the preceding remarks, it is respectfully requested that the §102(b) rejections be withdrawn.

It is now believed that this application is in condition for allowance. If the Examiner believes that personal contact with Applicant's representative would expedite prosecution of this application, she is invited to call the undersigned at his convenience.

Respectfully submitted,

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